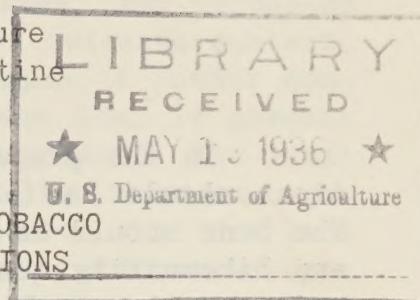


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United States Department of Agriculture
Bureau of Entomology and Plant QuarantineTHE CONTROL OF FLEA BEETLES ATTACKING TOBACCO
IN THE SOUTHERN TOBACCO-PRODUCING REGIONSBy J. U. Gilmore and F. S. Chamberlin,
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INTRODUCTION

The flea beetles 1/ are among the most injurious insects affecting the tobacco plant in the United States. These small beetles are only about one-twelfth inch in length, and their presence on tobacco plants is often unnoticed until considerable damage has resulted. The plants are injured by the adult beetles eating small holes partly or entirely through the leaves. This injury may begin in tobacco plant beds and continue during the entire period of growth of the plant. These small holes and injured surfaces on the leaves often cause young plants to be undesirable for transplanting to the field, and when maturing tobaccos are attacked the value of the cured leaf is reduced. The flea beetles usually feed on the upper surface of the leaves in tobacco plant beds and on newly set tobacco, but on larger plants they usually feed on the underside of the leaves.

LOSSES DUE TO FLEA BEETLES

The flea beetles are responsible for damage to the tobacco crop amounting to many thousands of dollars annually. Tobacco graders and buyers have estimated that leaves of sun-grown tobacco may lose from 15 to 25 percent of their value as a result of flea-beetle injury. The shade-grown tobacco leaves used for cigar wrappers are often reduced 50 percent or more in value by flea-beetle attack. The value of all sun-grown tobacco produced in the United States annually totals approximately \$150,000,000, while the value of shade-grown cigar wrapper types is at least \$3,000,000. These figures emphasize the importance of controlling infestations of flea beetles in fields of tobacco. If the depreciation in the value of the crop due to the depredations of flea beetles was 10 percent, the minimum loss would amount to approximately \$15,300,000 annually.

1/ The tobacco flea beetle (Epitrix parvula Fab.) and the potato flea beetle (Epitrix cucumeris Harr.).

CONTROL OF FLEA BEETLES

Plant beds

In the preparation of tobacco plant beds, all possible precautions should be taken to prevent flea beetles from gaining entrance. The beds should be located as far as possible away from tobacco fields and hibernating quarters of the flea beetles. The sides of the plant beds should be well banked and contain a ridge pole or board around the margins of the bed. These poles or boards should be fitted closely at the corners to prevent flea beetles from migrating into the enclosure. The beds should be covered with a good quality of cheesecloth containing at least 25 strands per linear inch and attached closely to the poles or boards around the margins. If these precautions are observed, flea beetles can often be prevented from entering the plant beds. In many instances the beds are steamed or burned prior to planting, and this treatment will kill all flea beetles which may be in the area covered by the bed at the time of planting.

For the various types of sun-grown tobaccos, the most satisfactory control for flea beetles in plant beds, as shown by experiments during 1934 and 1935, is a derris or cubé dust mixture containing 1 percent of rotenone, applied at the rate of 8 ounces per 100 square yards of plant bed, the applications being repeated every 4 days until control is obtained. The purpose of this paper is to make available these recommendations for the control of flea beetles attacking tobacco, and it is in the nature of a progress report. The recommendations apply to the southern tobacco-growing regions, since the writers have not had an opportunity to test them under conditions that prevail in Connecticut, Ohio, and Wisconsin.

If a commercially prepared dust containing less than 1 percent of rotenone is used, the dosage rate should be governed by the standard of 8 ounces per 100 square yards of plant bed surface for the 1-percent dust. For example, if the commercially prepared dust contains approximately 0.5 percent of rotenone, a dosage of 16 ounces of the dust should be applied for each 100 square yards of plant bed.

To prepare a home-mixed dust containing 1 percent of rotenone, use the following formula:

Derris or cubé powder (4 percent of rotenone) 25 lbs. (1 part by weight).
Diluent (clay or sterilized tobacco dust) 75 lbs. (3 parts by weight).

If the rotenone content of the derris or cubé powder is greater or less than 4 percent, the proportions of the diluent must be varied accordingly. For example, a powder containing 5 percent of rotenone should be mixed with 4 parts of the diluent by weight; that is, at the rate of 20 pounds of the powder containing 5 percent of rotenone and 80 pounds of the diluent, in order to obtain a 1-percent dust.

The rotenone content of derris and cubé varies, and purchases of these insecticides should be made on the basis of rotenone content, total extractives, and degree of fineness. For example, a powder containing 4 percent of rotenone should contain not less than 14 percent total carbon-tetrachloride or ether extractives. In general, the total extract should average approximately 3-1/2 times the rotenone content. The powder should be of such a degree of fineness that not less than 90 percent of it will pass through a sieve having 200 meshes per linear inch, and all of the material (100 percent) should pass through a sieve having 80 meshes per linear inch. Insecticide manufacturers now sell high-grade, finely ground derris and cubé powder of specified rotenone content made by blending various analyzed batches.

In the majority of plant beds of the sun-grown types of tobacco, the cheesecloth covering is not more than 12 inches above the surface of the bed. In such beds the dust can be applied with a crank duster directly through the cheesecloth to the young plants. In beds of other types, the cheesecloth cover must be removed prior to an application of dust. The crank duster is a more satisfactory type of machine for plant-bed applications, since a more uniform coverage can be obtained.

Newly set tobacco

When tobacco plants are transplanted from bed to field, the leaves often wilt and rest on the ground for several days until the plant can take root and start growth. In this wilted condition the leaves are highly susceptible to flea beetle injury, and control measures are difficult to apply effectively.

The most satisfactory control for flea beetles on newly set tobacco is derris or cubé dust containing 1 percent of rotenone, applied at the rate of 3 to 5 pounds per acre. To obtain best results the first application should be made the day following transplanting, and other applications should follow at intervals of 4 days under favorable weather conditions. If rainfall occurs within 24 hours, the application should be repeated at once.

The hand-operated plunger or "puff" type dust gun is more economical for dusting newly set plants of the Burley and bright tobacco types. When operated properly, the dust is applied directly to the plants and a minimum quantity is lost upon the ground between plants. It is estimated that the small-type "puff" gun discharges approximately 3,000 puffs per pound of dust, and if a dosage of 3 pounds per acre is applied, this would give two or three puffs of dust per plant. These estimates are based upon an average setting of about 3,500 plants per acre. A heavier setting of plants should receive a correspondingly increased dosage of dust per acre. This duster is not recommended for use on plant beds or for the growing tobacco crop.

The crank-type duster is recommended for newly set shade-grown tobacco plants, since they are spaced closely in the row. With the crank duster a dosage of 5 pounds per acre of dust containing 1 percent of rotenone should be applied for newly set plants, at the intervals stated above.

The growing crop

In sun-grown tobacco fields the second brood of adult flea beetles usually appears at about the time the plants have produced from 6 to 8 leaves, and injury may result during the remainder of the growing season. For the growing crop a dust containing 1 percent of rotenone applied at the rate of 8 to 10 pounds per acre, depending upon the size of the tobacco, will control flea beetles effectively. These applications should be made every 7 days until the infestation is brought under control.

Outbreaks of tobacco hornworms 2/ sometimes appear on the growing tobacco plants, and both the derris and cubé dust mixtures have proved ineffective against these pests. An insecticide that will control the flea beetles and also the hornworms on sun-grown tobacco is composed of paris green 1 part and hydrated lime 6 parts. The lime used should be slaked and screened. The mixture should be applied with a crank duster at the rate of 5 pounds per acre at intervals of about 1 week until the infestation is under control.

For cigar-wrapper tobacco growing under shade in the Georgia-Florida tobacco section, a dust containing 1 percent of rotenone is recommended. A dosage of 6 to 10 pounds of dust per acre should be applied, depending upon the size of the plants. The application should be repeated at weekly intervals until the infestation is under control. The crank duster operated by hand is the most satisfactory type for applying the dust. Derris or cubé does not burn the tobacco foliage, and if sterilized tobacco dust is used as the diluent, there is no danger of an undesirable residue being left on the wrapper leaves. The dust, however, has little controlling effect on infestations of grasshoppers, which frequently attack shade tobacco.

DILUENTS FOR USE IN DERRIS OR CUBÉ DUSTS

The clay diluents used in commercial brands of derris or cubé dusts are satisfactory for use on sun-grown types of tobacco. These clays, however, may sometimes leave a white deposit on the leaves of shade-grown cigar wrapper tobacco, which is undesirable. The writers have found that sterilized tobacco dust is a very satisfactory diluent for use on shade-grown tobacco, and it does not leave an objectionable residue. If tobacco dust is used in the preparation of a home-mixed dust, it should be certified by the manufacturer that the material was a by-product from the manufacture of nicotine sulphate and that

2/ Phlegethontius quinquemaculata Haw. and P. sexta Joh.

the product is sterilized and free of pathogenic organisms which might spread tobacco diseases. The sterilized tobacco dust diluent is recommended as a substitute for the clay diluent only for shade-grown tobacco, where a residue problem exists.

ADDITIONAL INSECTICIDES SOMETIMES USED FOR FLEA BEETLE CONTROL

Barium fluosilicate

Field experiments during the past three years have demonstrated that barium fluosilicate is effective against flea beetles on tobacco, but that it may sometimes cause burning of the foliage. The danger of such burning is greatest when the material is used on shade-grown tobacco, while some injury has resulted from its use on plant beds. This insecticide can be used with a reasonable margin of safety on newly set plants. The barium fluosilicate should be mixed thoroughly with a satisfactory clay diluent, in the proportions of 8 parts of the poison to 2 parts of the diluent. The mixture should be applied with a crank duster at the rate of 4 to 6 pounds per acre, depending upon the size of the tobacco plants. For newly set plants, a dosage of 4 pounds per acre should be applied.

Grasshoppers often infest tobacco fields along with the flea beetles, and the derris or cubé dusts recommended for flea beetle control are ineffective against the grasshoppers. Barium fluosilicate is an effective poison against both grasshoppers and flea beetles and it may be used at the above dosages for controlling joint outbreaks of these two groups of insects. In the Florida-Georgia shade tobacco district the barium fluosilicate is recommended only for newly set plants, since it may cause burning of leaves on the growing tobacco crop.

Since the derris or cubé dusts are more desirable insecticides for flea beetles on tobacco and there is no danger of foliage injury, it is recommended that barium fluosilicate be used only to control joint infestations of grasshoppers and flea beetles.

Paris green

Paris green has a strong toxic action against flea beetles on tobacco when used in the proportions of 1 part paris green to 6 parts hydrated lime, on growing tobacco. The paris green-lime mixture is less effective than the derris and cubé dusts, and therefore it is usually not recommended as a flea beetle control.

When there is an infestation of hornworms and flea beetles present on tobacco, the paris green-lime mixture, made according to the formula 1 to 6, is recommended for use on sun-grown tobacco. The rate of application should be 5 pounds of the mixture per acre.

WHERE INSECTICIDES MAY BE OBTAINED

Information regarding the purchase of the insecticide materials mentioned in this circular may be obtained through local dealers in agricultural supplies, seedsmen, general stores, drug and department stores, or through the county agricultural agent, State Agricultural Experiment Station, or State Department of Agriculture.

CONTROL PROGRAM FOR FLEA BEETLES

For best results in the control of flea beetles attacking tobacco, the following schedule is recommended:

Control Program

| Age of tobacco | Control measures | Dosage rate | Recommendations |
|----------------------------|--|--|--|
| Plant beds | Construct beds so that sides and cheesecloth cover will serve as a barrier to the entrance of flea beetles. Derris or cube dust containing 1 percent of rotenone. (Use clay as a diluent.) Barium fluosilicate prepared by 8-2 formula when grasshoppers are present. (See page 5.) | 8 ounces of dust per 100 sq. yds. of plant bed. (See page 2.) | Locate beds as far as possible away from tobacco fields and hibernating quarters of the flea beetles. Use a hand-operated crank duster for applying dusts. Repeat applications every 4 days until insects are under control. |
| Newly set tobacco plants | Derris or cube dust containing 1 percent of rotenone. (Use clay as a diluent.) Barium fluosilicate prepared by 8-2 formula when grasshoppers are present. (See page 5.) | 3 to 5 pounds per acre. 4 to 6 pounds per acre. | Use "puff" type duster for sun-grown types of tobacco and a hand-operated crank duster for shade-grown types. Repeat applications every 4 days until insects are under control. |
| The growing tobacco plants | Derris or cube dusts containing 1 percent of rotenone. (Use clay as a diluent for sun-grown tobacco and sterilized tobacco dust for shade-grown tobacco. See page 4.) Paris green 1 part, lime 6 parts (lime slaked and screened). For sun-grown tobacco only and when hornworms are present. | 8 to 10 pounds per acre. 5 pounds per acre. | Use hand-operated crank duster and repeat applications every 7 days until insects are under control. |

